L18: Entry 6 of 17 File: USPT Jun 7, 2005

US-PAT-NO: 6904362
DOCUMENT-IDENTIFIER: US 6904362 B2

TITLE: Route guidance system, information delivery center, and vehicular route guidance apparatus

DATE-ISSUED: June 7, 2005

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APPL-NO: 10/ 214389 [PALM]
DATE FILED: August 8, 2002

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	2001-241746	August 9, 2001
JP	2001-243427	August 10, 2001
JP	2001-245047	August 10, 2001

INT-CL: [07] G01 C 21/00, G08 G 1/123

US-CL-ISSUED: 701/211; 701/206, 701/208, 701/209, 701/210, 701/211, 340/995.1, 340/995.12, 340/995.18, 340/995.19, 340/995.2, 340/995.21, 340/996
US-CL-CURRENT: 701/211; 340/995.1, 340/995.12, 340/995.18, 340/995.19, 340/995.2, 340/995.21, 340/996, 701/206, 701/208 , 701/209, 701/210

FIELD-OF-SEARCH: 701/211, 701/206, 701/208, 701/209, 701/210, 340/995.1, 340/995.17, 340/995.18, 340/995.2, 340/995.21, 340/996

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	6484093	November 2002	Ito et al.	701/211
☐	6526284	February 2003	Sharp et al.	455/456.6
☐	6594580	July 2003	Tada et al.	701/211

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
10-019588	January 1998	JP	
2001-147132	May 2001	JP	

ART-UNIT: 3661

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ABSTRACT:

An information center generates packets of route guidance information, each corresponding to a prescribed road length of a recommended route. The information center may generate major guide point information and guidance information and transmit both to a vehicular apparatus. The vehicular apparatus provides guidance only for major guide points based on the received major guide point information if it cannot receive the guidance information. According to another aspect of the invention, if the end of a route segment which was the subject of the preceding route guidance information is on an expressway or toll road, guidance information for a preliminary route from that end to an escape position ahead on the expressway or toll road is first transmitted and then information for a remaining route, that is a segment of the recommended route having the prescribed road length minus the preliminary route, is then transmitted. If communication with the information center is lost, the vehicular apparatus performs guidance for the preliminary route to an interchange, for example, of the expressway using the preliminary route guidance information.

20 Claims, 17 Drawing figures

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L18: Entry 4 of 17 File: PGPB Mar 11, 2004

DOCUMENT-IDENTIFIER: US 20040049340 A1
TITLE: Navigation device

Current US Classification, US Secondary Class/Subclass:
701/208

Summary of Invention Paragraph:
[0002] The present invention relates to a navigation device and more particularly to a navigation device characterized in displaying of entrances and exits of roads that have fixed entrances and exits, such as expressways and toll roads.

Summary of Invention Paragraph:
[0003] As this type of apparatus, the navigation device disclosed in JP-A-H3-92714 is conventionally known. This navigation device disclosed in JP-A-H3-92714 is so constituted as to detect the present position of a vehicle, identify a point to be displayed closest to the present position, and display the name of the point. Therefore, with the navigation device disclosed in JP-A-H3-92714, an entrance or exit of an expressway can be displayed as the point closest to the present position of a vehicle. This is done by registering the entrances and exits of the expressway as points to be displayed.

Summary of Invention Paragraph:
[0004] However, the navigation device disclosed in JP-A-H3-92714 involves a problem. The problem is associated with the fact that the device does not discriminate between expressway and open road as point to be displayed. When the user driving on an expressway tries to search the nearest exit, points to be displayed on open roads near the expressway may be displayed. This problem is pronounced especially when an entrance of an expressway is searched. More specifically, where an entrance of an expressway is searched at a point distant from the expressway, there can be points to be displayed on many open roads between the present position and the expressway. Therefore, with the navigation device disclosed in JP-A-H3-92714, the entrance closest to the present position cannot be often displayed.

Summary of Invention Paragraph:
[0005] The navigation device disclosed in JP-A-H9-101161, known as a prior art, is provided with a displaying function. This function is to display the name of the interchange closest to the present position on an expressway and the distance thereto when an exit is searched during driving on the expressway. To carry out this function, the navigation device disclosed in JP-A-H9-101161 is provided with another function. This function is to exclude points to be displayed on open roads from targets to be searched during driving on an expressway.

Summary of Invention Paragraph:
[0006] However, this navigation device disclosed in JP-A-H9-101161 also involves a problem. The above-mentioned excluding function does not work during driving on an open road. Therefore, the above-mentioned problem associated with occasions where an entrance to an expressway is searched on an open road remains unsolved. That is, the navigation device disclosed in JP-A-H9-101161 cannot meet users' demand to search an entrance to an expressway on which the user is going to drive. Further,

the navigation device disclosed in JP-A-H9-101161 only displays the name of the interchange closest to the present position on an expressway. Therefore, the device cannot cope with cases where the user driving on an expressway desires to know how many interchanges are present between the present position and the exit which the user is going to use.

Summary of Invention Paragraph:
[0007] The navigation device disclosed in JP-A-H9-96541, known as a prior art, is provided with another function. This function is to, if there is an expressway in shown routes, carry out computation and display the name of an interchange at which the user should exit from the expressway and the distance to the interchange.

Summary of Invention Paragraph:
[0008] However, this navigation device disclosed in JP-A-H9-96541 involves a problem as well. The device cannot cope with cases where the user driving on an expressway desires to know how many interchanges are present before the user arrives at an exit. Further, the navigation device disclosed in JP-A-H9-96541 is not provided with a function to meet users' desire to search entrances to an expressway on which the user is going to drive. More specifically, where a place of departure and a destination are fixed, this navigation device disclosed in JP-A-H9-96541 is capable of displaying exits of an expressway in shown routes between the place of departure and the destination. However, where the user desires to drive on an expressway without fixing any destination, the device cannot show the user entrances to the expressway.

Summary of Invention Paragraph:
[0009] The navigation device disclosed in JP-A-H7-49654, known as a prior art, is provided with another function. The function is to store spot data representing the positions and names of interchanges on expressways. Further, the function is to, when a vehicle is driving on an expressway, search interchanges present in the traveling direction and display the names of the interchanges in ascending order of the distances to the present position. With this navigation device disclosed in JP-A-H7-49654, the user driving on an expressway can easily know how many interchanges are present before the interchange at which the user should exit from the expressway. Thus, the user can drive the car without paying attention to interchange signs above the road.

Summary of Invention Paragraph:
[0010] This navigation device disclosed in JP-A-H7-49654 is provided with a further function for navigation in cases where the user drives from open roads to a desired destination by way of an expressway. This function is to show routes which connect the present point on an open road, an entrance to an expressway, an exit from the expressway, and a destination.

Summary of Invention Paragraph:
[0011] However, the navigation device disclosed in JP-A-H7-49654 is so designed as to display the exit closest to the present position when a destination is fixed. Therefore, the device cannot cope with cases where the user desires to drive on an expressway without fixing any destination for the time being and search the entrance closest to the present position. Further, the navigation device disclosed in JP-A-H7-49654 is so constituted as to carry out the display of entrances in relation with shown routes. Therefore, the device cannot display a plurality of entrances to the expressway concerned in ascending order of the distances to the present position. This cannot fulfill the above-mentioned drivers' intention only to drive on expressways. Therefore, the device cannot cope with, especially, cases where the user selects the entrance next closer to the present position, not the closest entrance depending on whether the user drives on the expressway in the up direction or in the down direction.

Summary of Invention Paragraph:

[0012] With conventional navigation devices, entrances and exits of an expressway can be searched by name without fixing any destination. In this case, a driver can use a method by which the driver makes the list of the names of the interchanges on the expressway appear on a display and selects the name of an interchange which the user is going to use. However, since a list of interchange names shows interchanges in an appellative sequence (e.g., alphabetical sequence), users can use this function only when the users know the names of entrances or exits.

Summary of Invention Paragraph:
[0021] Therefore, the conventional navigation devices are insufficient in a function of showing the interchanges of an expressway to a user who desires to drive on the expressway without expressly fixing any destination.

Summary of Invention Paragraph:
[0023] To achieve the above object, a navigation device is provided with the following. A display unit, an input unit, and a control unit are provided for displaying inputted map data that contain information on roads with entrances and exits. After a road with entrances and exits is specified by a user, a search reference position is determined. Entrances or exits of the road are thereby sorted and listed in a sequence on a basis of the search reference position in the display unit.

Summary of Invention Paragraph:
[0026] The navigation device of the present invention is capable of sorting entrances or exits on which the user is going to drive in a sequence on the basis of a search reference position. Moreover, the navigation device is capable of listing the sorted entrances or exits. Thus, the user can easily find which entrance or exit the user should use.

Summary of Invention Paragraph:
[0027] In drive routing assistance implemented with ordinary navigation devices as well, computation to find the entrance closest to the present position is carried out. However, this computation cannot be done unless a destination is fixed. By contrast, in the present invention, a road with entrances and exits can be specified, a search reference position can be determined, and the entrance list can be displayed. Thus, unlike ordinary navigation devices, the present invention can present entrances to an expressway to a user when the user desires only to drive down the expressway without fixing any destination. Furthermore, this presentation is made in the form of list so that the user can select an entrance with ease. The present invention is completely different from prior arts in that.

Summary of Invention Paragraph:
[0028] Furthermore, with this structure, a user driving down an open road can specify a road with entrances and exits on which the user is going to drive and can in advance check exits from the road with entrances and exits. Further, the navigation device of the present invention is provided with another function associated with the generation of exit lists. To carry out this function, a search reference position can be determined. Thus, an exit list can be generated with a position other than the present position, for example, a destination the user desires to drive to after getting off an expressway, taken as the search reference position. In this case, driving routes are shown in the direction opposite to the traveling direction. As mentioned above, the navigation device of the present invention not only provides a vehicle driving on an expressway with information on interchanges which will be encountered in the traveling direction. Also, the navigation device is capable of presenting exit lists meeting the user's varied demands when the user specifies a road to be searched.

Brief Description of Drawings Paragraph:
[0030] FIG. 1 is a block diagram illustrating the constitution of the navigation device in the first embodiment.

Detail Description Paragraph:
[0073] A first embodiment of the present invention will be described in connection with drawings. FIG. 1 is a block diagram schematically illustrating the constitution of the navigation device in the embodiment. As illustrated in the figure, the navigation device 1 includes a position sensor 10, a map data input unit 21, an operating switch group 22, a control unit 23, an external memory 24, a display unit 25, a remote controller sensor 26, a remote controller 27, a transmitter-receiver 28, and a VICS sensor 29.

Detail Description Paragraph:
[0076] The control unit 23 is constituted as an ordinary computer with CPU, ROM, RAM, I/O ports, and the like built therein. The control unit 23 executes computer programs installed in the ROM or the external memory 24, and thereby performs various types of processing. Such processing includes varied processing executed by ordinary car navigation devices, such as the display of maps, route computation, and routing assistance based on the results of route computation. It also includes processing for displaying lists of entrances and exits of expressways, which is one of the features of the embodiments of the present invention.

Detail Description Paragraph:
[0077] The external memory 24 is composed of a hard disk drive. The external memory 24 is used to enhance the operationality and functionality of the navigation device. For example, the external memory 24 stores map data and the like displayed on the display unit 25. Thus, when a map is displayed again, it is unnecessary to start up the map data input unit 21 to repeat read operation. The external memory 24 is also used to store computer programs, varied data, and like required for processing performed by the control unit 23.

Detail Description Paragraph:
[0078] The display unit 25 is a color liquid crystal display unit. On the screen of this display unit 25, information related to operation performed in ordinary car navigation devices is displayed. Such information includes a mark corresponding to the present position of the vehicle concerned, maps, marks for destinations specified by the user, routes to destinations computed based on the user's specifications, and the like. The display unit 25 also displays lists of entrances and exits of expressways, which is one of the features of this embodiment.

Detail Description Paragraph:
[0079] The remote controller 27 is for inputting information, similar to information inputted through the operating switch group 22, by remote control. Therefore, when a user operates the navigation device 1 in this embodiment, the user can input information through the remote controller 27, instead of the operating switch group 22. The remote controller sensor 26 is a sensor for detecting information inputted through the remote controller 27 and inputting the information to the control unit 23.

Detail Description Paragraph:
[0081] Next, referring to the flowcharts in FIG. 2 to FIG. 4, the details of processing for showing entrances (ENT) and exits (EXT) of an expressway (EWY), performed by the control unit 22 in this navigation device 1, will be described. This processing is initiated when the user inputs an actuation signal through the operating switch group 22 or the remote controller 27.

Detail Description Paragraph:
[0086] Thus, the driving routes and the distances to drive to a plurality of the entrances are computed. Then, the entrances extracted at S90 are sorted in ascending order of the distances to drive (S120). An entrance list based on the result of this sorting is displayed on the display unit 25 (S130). In the entrance list, the entrances extracted at S90 and the distances to drive computed at S110

are listed in pairs in ascending order of the distances to drive. FIG. 5 illustrates an example of the displayed entrance list. In case of the example in the figure, an entrance list 41 in which entrances of Tomei Expressway are listed is displayed. In this entrance list, the interchanges (IC) (Nagoya interchange, Ichinomiya interchange, Miyoshi interchange, . . .) are listed in ascending order of the distances to drive to get there from the present position. It can be seen from this example that the entrance list 41 displays the names of the entrances in a sequence different from the actual sequence of the entrances of the expressway. If the interchanges are listed in the actual sequence of the entrances of Tomei Expressway, the interchange names must be listed in the order of . . . , Ichinomiya interchange, . . . , Nagoya interchange, Miyoshi interchanges . . . . As mentioned above, one of the features of the navigation device 1 in this embodiment is that interchanges of an expressway are not listed in the actual sequence thereof.

Detail Description Paragraph:
[0112] As described above, according to the second embodiment, a user can switch between the entrance list in ascending order of the distances to drive from the present position and the entrance list in alphabetical sequence. Thus, the navigation device can provide a user with more convenient usage depending on the user's experience. For example, if the user is not acquainted with the names of the interchanges of an expressway and desires to find an entrance to the expressway, the user can use the entrance list in ascending order of the distances to drive. If the user is acquainted with the names of the interchanges of an expressway and desires to find an entrance to the expressway, the user can use the entrance list in alphabetical sequence.

Detail Description Paragraph:
[0113] Similarly, according to the second embodiment, a user can switch between the exit list in ascending order of the distances to drive to a destination and the exit list in alphabetical sequence. Thus, the navigation device can provide a user with more convenient usage depending on the user's experience. For example, if the user is not acquainted with the names of the interchanges of an expressway and desires to find an exit from the expressway, the user can use the exit list in ascending order of the distances to drive. If the user is acquainted with the names of the interchanges of an expressway and desires to find an exit from the expressway, the user can use the exit list in alphabetical sequence.

Detail Description Paragraph:
[0129] The user may operate the operating switch group 22 or the remote controller 27 to specify a point on the map or input "Execute." If the user specifies a point, for example, a service area, on the map (S1040: Specify point), the position coordinates of the specified point are stored in the RAM as the search reference position (S1050). Alternatively, if the user inputs "Execute" (S1040: Execute), the node closest to the center of the presently displayed-map is stored in the RAM as the search reference position (S1060).

Detail Description Paragraph:
[0164] The user may operate the operating switch group 22 or the remote controller 27 to specify a point on the map or input "Execute." If the user specifies a point, for example, a service area, on the map (S2040: Specify point), the position coordinates of the specified point are stored in the RAM as the search reference position (S2050). Alternatively, if the user inputs "Execute" (S2040: Execute), the node closest to the center of the presently displayed map is stored in the RAM as the search reference position (S2060).

Detail Description Paragraph:
[0192] The user may operate the operating switch group 22 or the remote controller 27 to specify a point on the map or input "Execute." If the user specifies a point, for example, a service area, on the map (S2840: Specify point), the position coordinates of the specified point are stored in the RAM as the search reference

position (S2850). Alternatively, if the user inputs "Execute" (S2840: Execute), the node closest to the center of the presently displayed map is stored in the RAM as the search reference position (S2860).

Detail Description Paragraph:
[0208] For example, the present invention can be applied to a navigation device for searching the entrances and exits of roads with entrances and exits fixed other than expressways. Such roads include freeways, toll roads, cycling roads, and walks. Therefore, the navigation device of the present invention can be constituted as a portable device as well as in-vehicle device.

CLAIMS:

1. A navigation device including: a display unit; a map data input unit for inputting map data, wherein the map data contains information on a plurality of roads with entrances and exits, such as expressways and toll roads; and a display control unit for displaying the map data inputted from the map data input unit on the display unit, the navigation device comprising: a road specifying unit for specifying a certain road from the plurality of roads; a search reference position determining unit for determining a search reference position; and an entrance list display control unit for sorting entrances to the certain road specified by the road specifying unit in a sequence on a basis of the search reference position determined by the search reference position determining unit and for listing the sorted entrances in the sequence as an entrance list on the display unit.

2. The navigation device according to claim 1, wherein the entrance list display control unit includes an entrance extracting unit that extracts all entrances to the certain road specified by the road specifying unit, and wherein the entrance list display control unit sorts all the entrances extracted by the entrance extracting unit.

3. The navigation device according to claim 1, wherein the entrance list display control unit includes an entrance extracting unit for extracting entrances meeting condition on the basis of the search reference position from all entrances to the certain road specified by the road specifying unit, and wherein the entrance list display control unit sorts the entrances extracted by the entrance extracting unit.

4. The navigation device according to claim 1, wherein the entrance list display control unit includes a driving route determining unit that determines driving routes between the search reference position and respective entrances to the certain road, and wherein the entrance list display control unit sorts the entrances to the certain road based on driving times required for driving down the driving routes determined by the driving route determining unit.

5. The navigation device according to claim 4, wherein the entrance list display control unit sorts the entrances to the certain road in ascending order of the driving times.

6. The navigation device according to claim 4, wherein the entrance list display control unit lists, in pairs in the entrance list, the sorted entrances and the driving times, which correspond to the sorted entrances, respectively.

7. The navigation device according to claim 1, wherein the entrance list display control unit includes a driving route determining unit that determines driving routes between the search reference position and respective entrances to the certain road, and wherein the entrance list display control unit sorts the entrances to the certain road based on lengths of driving routes determined by the driving route determining unit.

8. The navigation device according to claim 7, wherein the entrance list display control unit sorts the entrances to the certain road in ascending order of the lengths of the driving routes.

9. The navigation device according to claim 7, wherein the entrance list display control unit lists, in pairs in the entrance list, the sorted entrances and the lengths of the driving routes, which correspond to the sorted entrances, respectively.

10. The navigation device according to claim 1, wherein the entrance list display control unit sorts the entrances to the certain road based on linear distances between the search reference position and the respective entrances.

11. The navigation device according to claim 10, wherein the entrance list display control unit sorts the entrances to the certain road in ascending order of the linear distances.

12. The navigation device according to claim 10, wherein the entrance list display control unit lists, in pairs in the entrance list, the sorted entrances and the linear distances, which correspond to the sorted entrances, respectively.

13. The navigation device according to claim 1, further comprising: a present position detecting unit for detecting a present position, wherein the search reference position determining unit identifies the present position detected by the present position detecting unit as the search reference position.

14. The navigation device according to claim 1, further comprising: a position specifying unit for specifying a position on the map data, wherein the search reference position determining unit identifies the position specified by the position specifying unit as the search reference position.

15. The navigation device according to claim 1, further comprising: a scrolling unit for scrolling a map displayed on the display unit, wherein the search reference position determining unit identifies, as the search reference position, a given position on a map that is displayed on the display unit after being scrolled by the scrolling unit.

16. The navigation device according to claim 1, wherein the entrance list display control unit includes a display switching unit for switching the sequence of entrances in the entrance list to an appellative sequence.

17. The navigation device according to claim 1, further comprising: an entrance selecting unit for selecting an entrance from the entrance list; and a selected entrance storing unit for storing the entrance selected by the entrance selecting unit.

18. A navigation device including: a display unit; a map data input unit for inputting map data, wherein the map data contains information on a plurality of roads with entrances and exits, such as expressways and toll roads; and a display control unit for displaying the map data inputted from the map data input unit on the display unit, the navigation device comprising: a road specifying unit for specifying a certain road from the plurality of roads; a search reference position determining unit for determining a search reference position; and an exit list display control unit for sorting exits from the certain road specified by the road specifying unit in a sequence on a basis of the search reference position determined by the search reference position determining unit and for listing the sorted exits in the sequence as an exit list on the display unit.

19. The navigation device according to claim 18, wherein the exit list display control unit includes an exit extracting unit that extracts all exits from the

certain road specified by the road specifying unit, and wherein the exit list display control unit sorts all the exits extracted by the exit extracting unit.

20. The navigation device according to claim 18, wherein the exit list display control unit includes an exit extracting unit for extracting exits meeting condition on the basis of the search reference position from all exits from the certain road specified by the road specifying unit, and wherein the exit list display control unit sorts the exits extracted by the exit extracting unit.

21. The navigation device according to claim 18, wherein the exit list display control unit includes a driving route determining unit that determines driving routes between the search reference position and respective exits from the certain road, and wherein the exit list display control unit sorts the exits from the certain road based on driving times required for driving down the driving routes determined by the driving route determining unit.

22. The navigation device according to claim 21, wherein the exit list display control unit sorts the exits from the certain road in ascending order of the driving times.

23. The navigation device according to claim 21, wherein the exit list display control unit sorts the exits from the certain road in descending order of the driving times.

24. The navigation device according to claim 21, wherein the exit list display control unit lists, in pairs in the exit list, the sorted entrances and the driving times, which correspond to the sorted entrances, respectively.

25. The navigation device according to claim 18, wherein the exit list display control unit includes a driving route determining unit that determines driving routes between the search reference position and respective exits from the certain road, and wherein the exit list display control unit sorts the exits from the certain road based on lengths of driving routes determined by the driving route determining unit.

26. The navigation device according to claim 25, wherein the exit list display control unit sorts the exits from the certain road in ascending order of the lengths of the driving routes.

27. The navigation device according to claim 25, wherein the exit list display control unit sorts the exits from the certain road in descending order of the lengths of the driving routes.

28. The navigation device according to claim 25, wherein the exit list display control unit lists, in pairs in the exit list, the sorted entrances and the lengths of the driving routes, which correspond to the sorted entrances, respectively.

29. The navigation device according to claim 18, wherein the exit list display control unit sorts the exits from the certain road based on linear distances between the search reference position and the respective exits.

30. The navigation device according to claim 29, wherein the exit list display control unit sorts the exits from the certain road in ascending order of the linear distances.

31. The navigation device according to claim 29, wherein the exit list display control unit sorts the exits from the certain road in descending order of the linear distances.

32. The navigation device according to claim 29, wherein the exit list display

control unit lists, in pairs in the exit list, the sorted entrances and the linear distances, which correspond to the sorted entrances, respectively.

33. The navigation device according to claim 18, further comprising: a present position detecting unit for detecting a present position, wherein the search reference position determining unit identifies the present position detected by the present position detecting unit as the search reference position.

34. The navigation device according to claim 18, further comprising: a position specifying unit for specifying a position on the map data, wherein the search reference position determining unit identifies the position specified by the position specifying unit as the search reference position.

35. The navigation device according to claim 18, further comprising: a scrolling unit for scrolling a map displayed on the display unit, wherein the search reference position determining unit identifies, as the search reference position, a given position on a map that is displayed on the display unit after being scrolled by the scrolling unit.

36. The navigation device according to claim 18, wherein the exit list display control unit includes a display switching unit for switching the sequence of exits in the exit list to an appellative sequence.

37. The navigation device according to claim 18, further comprising: an exit selecting unit for selecting an exit from the exit list; and a selected exit storing unit for storing the exit selected by the exit selecting unit.

38. A sorting and listing method used in a navigation device that includes: a display unit; a map data input unit for inputting map data, wherein the map data contains information on a plurality of roads with entrances and exits, such as expressways and toll roads; and a display control unit for displaying the map data inputted from the map data input unit on the display unit, the method comprising steps: specifying a certain road from the plurality of roads; determining a search reference position; and sorting and listing, in the display unit, one set of a first and second sets, wherein the first set includes entrances to the specified certain road and the second set includes exits from the specified certain road, in a sequence on a basis of the determined search reference position.

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L18: Entry 4 of 17 File: PGPB Mar 11, 2004

PGPUB-DOCUMENT-NUMBER: 20040049340
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040049340 A1

TITLE: Navigation device

PUBLICATION-DATE: March 11, 2004

INVENTOR-INFORMATION:

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APPL-NO: 10/ 653265 [PALM]
DATE FILED: September 3, 2003

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	DOC-ID	APPL-DATE
JP	2002-259575	2002JP-2002-259575	September 5, 2002

INT-CL: [07] G01 C 21/34

US-CL-PUBLISHED: 701/209; 701/208, 340/995.19
US-CL-CURRENT: 701/209; 340/995.19, 701/208

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

Processing for showing entrances to expressways proceeds as follows. A user specifies an expressway and selects a display of entrance list. Then, all the entrances of the specified expressway, located within an L1 (km)-radius circle of a present position are extracted. Driving routes to the respective entrances are computed, and lengths of the respective driving routes are computed. Thereafter, the entrances are sorted in ascending order of the lengths of the respective driving routes, and an entrance list based on the result of this sorting is displayed on a display unit. In the entrance list, the entrances and lengths are listed in pairs in ascending order of the lengths. Further, after a format for storing the entrance is specified from among destination, way point, memory point, and point to be bypassed, processing is performed according to the specified format.

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L18: Entry 5 of 17 File: PGPB Dec 11, 2003

PGPUB-DOCUMENT-NUMBER: 20030229631
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030229631 A1

TITLE: Database access mechanisms for a computer user interface

PUBLICATION-DATE: December 11, 2003

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APPL-NO: 10/ 256968 [PALM]
DATE FILED: September 27, 2002

RELATED-US-APPL-DATA:
Application is a non-provisional-of-provisional application 60/386393, filed June 5, 2002,

INT-CL: [07] G06 F 7/00

US-CL-PUBLISHED: 707/3
US-CL-CURRENT: 707/3

REPRESENTATIVE-FIGURES: 9

ABSTRACT:

The disclosure relates to providing access to database objects. A first view displays first and second database access mechanisms. The first database access mechanism includes at least one database access pattern including a predefined search of the database. The second database access mechanism includes at least one selection function and an input function, for searching a selected subset of the database for objects having an input value. The second database access mechanism is also capable of adding a database access pattern to the first database access mechanism. A third database access mechanism comprises an attribute choice and an input field to search for database objects having the input value associated with a chosen attribute.

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application No. 60/386,393, filed Jun. 5, 2002, and titled "User Interface with Object Identification Area," which is incorporated by reference in its entirety.

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L18: Entry 5 of 17 File: PGPB Dec 11, 2003

DOCUMENT-IDENTIFIER: US 20030229631 A1
TITLE: Database access mechanisms for a computer user interface

Current US Classification, US Primary Class/Subclass:
707/3

Detail Description Paragraph:
[0034] An information row 244 for the table 242 of business objects, located along the bottom of display 200, contains a page number indicator 246 near its right side (page 31 of 34 in this example, indicating that there are thirty-four pages of business objects in table 242, and that page thirty-one is currently displayed). A group of buttons 248 for navigating between pages, for example by going backward or forward by one page, or by jumping to the first or last page, is located near the left side of the information row 244.

Detail Description Paragraph:
[0039] A results area 404, below the search bar 402, contains the unchanged functional area 224 (described above) from FIG. 2, and a table 408 of most recently created account objects, below the functional area 224. Table 408 presents five objects, each retrieved from database 62 according to the "last created accounts" search pattern from Show mechanism 406. Object 410 (Chiptech) is selected, as indicated by a highlighted selection icon 412 near the left edge of the object 410. The other objects in the table 408 are "Farbenfroh AG," "Nathalie's Kunde," "NorthTel," and "SAP AG." An information row 414, along the bottom of results area 404, contains a page number indicator 416 near its right edge (page 1 of 1 in this example). The group of buttons 248 for navigating between pages, near the left edge of the information row 414, appears unchanged from the FIG. 2 display 200 and is as described above.

Detail Description Paragraph:
[0046] A results area 604, below the search bar 602, presents the unchanged functional area 224 (FIG. 2), and an updated table 608 of objects, below the functional area 224. Table 608 contains four objects, each having City field entries beginning with "FORT." Object 410 (Chiptech, located in Fort Lauderdale) is shown, along with object 610 (Applied Telephone Technology, located in Fort Collins). The other two object names are Smarttech and NorthTel, each based in Fort Lauderdale. Thus, it is seen that all objects representing businesses located in cities beginning with "Fort" have been identified and displayed in display 600. The user may now locate the desired account. Referring again to FIG. 6, an information row 612 contains a page number indicator 614 near its right side, and the unchanged page navigation buttons 248 near its left side.

Detail Description Paragraph:
[0053] The results area 707, below the advanced search area 706, contains the unchanged functional area 224 (described above) from display 200 (FIG. 2), and an updated table 736 of objects. The table 736 of objects shows five objects (although, as will be explained below, table 736 totally consists of eight pages). The shown objects in table 736 are "AM Comm Technologies," "AWL-Techniek B.V.," "Applied Telephone Technology," "Asia High tech inc.," and "BEA High Tech." Thus, it is seen that the database search initiated by the selection of the Go button 724

from advanced search area 706 produces a resulting table 736 of objects satisfying the search criteria (the letters "tech" in the Name 1 field). An information row 738, below the table 736 of objects, provides a page number indicator 740 (page 1 of 8, in this example, indicating that table 736 consists of eight pages, with only the first page shown in display 700), near its right edge. The unchanged page navigation buttons 248 from display 200 (FIG. 2) appear near the left edge of the information row 738.

Detail Description Paragraph:
[0056] A search pattern list box 732, to the right of the "Add to `Show`" button 730, contains a list of the Show mechanism search patterns. A user may select a search pattern from the box 732 and remove it from the Show mechanism 704 list by selecting a "Remove from `Show`" button 734, to the right of the box 732. Thus, it is seen that the advanced search area 706 conveniently facilitates the addition (removal) of search patterns to (from) the Show mechanism 704. This coupling between the Show search mechanism 704 and the advanced search mechanism provides a powerful combination of quick access via defined patterns in the Show mechanism 704, and complex search formulation and search pattern definition in the advanced search area 706, with the ability to thereafter quickly select the same search pattern from the Show mechanism 704. The combination of the Show mechanism 704, search tool 212, and advanced search area 714, collectively displayed in the FIG. 7 display 700, provides a user the flexibility to select the appropriate search mechanism, the convenience of easily switching between search mechanisms, and the potency of a powerful set of database access mechanisms.

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L13: Entry 1 of 1 File: USPT Jun 11, 2002

US-PAT-NO: 6405107
DOCUMENT-IDENTIFIER: US 6405107 B1

TITLE: Virtual instrument pilot: an improved method and system for navigation and control of fixed wing aircraft

DATE-ISSUED: June 11, 2002

INVENTOR-INFORMATION:

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APPL-NO: 09/ 759190 [PALM]
DATE FILED: January 11, 2001

INT-CL: [07] B64 C 13/18, B64 C 13/20, G05 D 1/00, G05 D 3/00, G06 F 17/00, G06 F 19/00

US-CL-ISSUED: 701/3; 701/11, 701/14, 701/13, 701/33, 701/122, 345/1.3, 345/856, 340/3.5, 340/500, 340/825.72, 340/947, 340/948, 340/979, 340/971, 340/999, 340/975, 340/973, 342/357.08, 342/401, 342/49, 434/29, 434/38, 434/43
US-CL-CURRENT: 701/3; 340/3.5, 340/500, 340/825.72, 340/947, 340/948, 340/971, 340/973, 340/975, 340/979, 340/999, 342/357.08, 342/401, 342/49, 345/1.3, 434/29, 434/38, 434/43, 701/11, 701/122, 701/13, 701/14, 701/33, 715/856

FIELD-OF-SEARCH: 701/3, 701/14, 701/11, 701/13, 701/33, 701/301, 701/122, 701/121, 701/120, 345/1.3, 345/856, 244/1R, 244/158R, 340/3.5, 340/500, 340/825.72, 340/947, 340/948, 340/979, 340/971, 340/995, 340/975, 340/973, 455/66, 342/357.08, 342/401, 342/49, 434/29, 434/38, 434/43

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4196474	April 1980	Buchanan et al.	701/301
☐	4209768	June 1980	Basov et al.	
☐	4326189	April 1982	Crane	340/973
☐	4767334	August 1988	Thorne et al.	43/29
☐	5153836	October 1992	Fraughton	701/301

☐	5296861	March 1994	Knight	342/357
☐	5610600	March 1997	Koenig	340/976
☐	5758297	May 1998	Gaultier	701/14
☐	5786773	July 1998	Murphy	340/947
☐	5801659	September 1998	Helfrick	342/357
☐	5945943	August 1999	Kalafus et al.	
☐	6031488	February 2000	Hua et al.	
☐	6057786	May 2000	Briffe et al.	
☐	6112141	August 2000	Briffe et al.	
☐	6119055	September 2000	Richman	
☐	26216	October 2001	Block	

ART-UNIT: 3661

PRIMARY-EXAMINER: Cuchlinski, Jr.; William A.

ASSISTANT-EXAMINER: Mancho; Ronnie

ABSTRACT:

A self contained electronic system for manual or automatic control and navigation of fixed winged aircraft using electronic position sensing such as GPS, DGPS, WAAS, and the like, as the primary sensor and making use of known flight characteristics of the aircraft to determine aircraft attitude without any interaction with the aircraft, its controls, or the outside environment and without any moving mechanical devices other than switches, dials and connectors. The automatic and visual interface between the system and the pilot provides for simplified flight controls, and a new solution to the hazard of disorientation, and will reduce the time needed for a pilot to become proficient in VFR and instrument flying. A single instrument replaces many of the conventional instruments used for flight. Navigation data is provided in an easy to understand graphical format. The pilot is told explicitly where to move aircraft controls. The absence of mechanical devices and presence of battery backup make the system extremely reliable and capable of continuing operation of the aircraft independent of the aircraft power or vacuum sources.

14 Claims, 9 Drawing figures

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L13: Entry 1 of 1 File: USPT Jun 11, 2002

DOCUMENT-IDENTIFIER: US 6405107 B1
TITLE: Virtual instrument pilot: an improved method and system for navigation and control of fixed wing aircraft

Abstract Text (1):
A self contained electronic system for manual or automatic control and navigation of fixed winged aircraft using electronic position sensing such as GPS, DGPS, WAAS, and the like, as the primary sensor and making use of known flight characteristics of the aircraft to determine aircraft attitude without any interaction with the aircraft, its controls, or the outside environment and without any moving mechanical devices other than switches, dials and connectors. The automatic and visual interface between the system and the pilot provides for simplified flight controls, and a new solution to the hazard of disorientation, and will reduce the time needed for a pilot to become proficient in VFR and instrument flying. A single instrument replaces many of the conventional instruments used for flight. Navigation data is provided in an easy to understand graphical format. The pilot is told explicitly where to move aircraft controls. The absence of mechanical devices and presence of battery backup make the system extremely reliable and capable of continuing operation of the aircraft independent of the aircraft power or vacuum sources.

Application Filing Date (1):
20010111

DATE ISSUED (1):
20020611

Brief Summary Text (2):
This invention describes a safer system of control and navigation of fixed wing aircraft. This development derives its accuracy from Satellite Global Positioning Systems (GPS). The Global Positioning Systems are generated by orbiting satellites which are located high above the earth. In some instances, a combination of satellites and supplementary ground systems, such as Wide Area Navigation Systems (WAAS), Differential GPS (DGPS), and the like may be employed to improve the overall navigation accuracy. The use of GPS systems in place of the usual radar and radio methods of navigation provides greatly improved four dimensional accuracy and simplicity of derived Instrument Landing Systems (ILS). The GPS derived ILS system of the present invention results in improved and more reliable flight safety over conventional ILS systems. In addition, a plurality of conventional flight and navigational instruments are replaced by a single compound instrument which provides accurate flight information in one display which is easy to understand. The flight instruments operate without vacuum or moving parts, eliminating the primary failure mechanisms for conventional devices.

Brief Summary Text (9):
If, for example, inclement weather closes in, and the pilot finds himself in the clouds, with little or no visibility, the only means of control that he has over his flight is by means of the aircraft instrumentation. Safe flight is then often

not possible without dependence upon navigation and control instruments. Furthermore, if there is an instrument failure while the pilot is in the clouds or in a fog, the pilot may become disoriented and such situations often prove to be fatal.

Brief Summary Text (10):
Aware of these problems, engineers have worked to improve the science of flight. In order to improve the safety of flying, engineers have developed radio and radar based instrumentation systems which enable a pilot to land his aircraft safely even when conditions are far from ideal, or when the pilot is unfamiliar with the airport at which he is attempting to land. Such systems are called "Instrument Landing systems" (ILS), and they have been developed to make landing safer and to save lives. These ILS systems are replaced by the present invention which does not depend upon radio or radar navigation.

Brief Summary Text (14):
It is well known to those who fly, that modem GPS systems are very accurate. These systems are rapidly replacing LORAN and other systems which are presently used for navigation, but do not provide altitude information.

Brief Summary Text (15):
The present invention, which the inventor calls a "Virtual Instrument Pilot" utilizes the aforementioned Global Positioning Systems to tell the pilot precisely where he is located with respect to actual spatial positions on the surface of the earth and in the air. The present invention, however, goes further than simply using the GPS as a navigational aid. The system described herein uses the GPS as an input source by which a complete functional aircraft control system can be accomplished in a single unified instrument and displayed upon a single display, which is readily understood by the pilot.

Brief Summary Text (16):
The reliability of the present invention stems from the avoidance of any moving parts or parts which are exposed to the environment during data acquisition. The data input is also isolated from the rest of the aircraft instrumentation. The present invention provides the equivalent of most of the needed flight instruments for Attitude determination, navigational Aids, and route control functions of modern avionics in a single, reliable instrument. This minimizes the instrument visual scan by the pilot that is presently required with separate units. A partial list of functional items normally found in separate flight instruments follows. These are:

Brief Summary Text (24):
The following instruments are found in aircraft navigational aids:

Brief Summary Text (25):
H) Distance from any established system or user defined navigational aid.

Brief Summary Text (26):
I) Bearing to any established system or user defined navigation aid.

Brief Summary Text (27):
J) Angular position relative to a specified bearing from any system or user defined navigation aid.

Brief Summary Text (38):
1) Provides the most needed flight indicators such as Attitude, Navigational Aids, and Route control functions of modern avionics are vested in a single, reliable instrument. This minimizes the instrument scan required by the pilot that is presently required with separate units.

Brief Summary Text (50):
When turned on, the invention provides simultaneous navigational information for marker beacons and up to three navigational aids. The instrument of the present invention will direct the pilot through maneuvers needed to execute preplanned flights, and landing patterns. The display of the present invention also shows an artificial horizon which differs from the conventional display in that the horizon is placed above or below cross hairs which represent the direction of flight rather than the pitch of the aircraft. The pitch of the aircraft can be seen by observing the height of the airplane figure above the artificial horizon. In this way, the pilot has an improved visual indication of whether he is climbing or descending.

Brief Summary Text (54):
One of the major advantages of the present invention is that it contains virtually all of the necessary instrumentation required to safely fly and navigate an aircraft anywhere in the world. These instruments are embodied in one convenient and independent package. The Virtual Instrument Pilot can function completely independent of the aircraft vacuum and power systems. In the event of a complete battery failure, the aircraft can continue to fly because the engines receive ignition energy from the engine magnetos. In the absence of all power, the Virtual Instrument Pilot of the present invention can continue to operate for a minimum of an hour on its own internal pre-charged batteries. The internal batteries are on continuous float charge while normal DC power is available. A transition-free connection to the internal batteries is made if normal power fails.

Brief Summary Text (56):
As noted earlier herein, if inclement weather closes in, and the pilot finds himself in the clouds, the only means of control that he has over his flight is by means of the aircraft instrumentation. Safe flight often then becomes impossible without dependence upon navigation and control instruments. Furthermore, if there is an instrument failure while the pilot is in the clouds or in a fog, the pilot may become disoriented and such situations can prove to be fatal. Very experienced pilots have been known to crash under these conditions. The present invention has been designed to eliminate and prevent such crashes.

Brief Summary Text (58):
One of the major advantages of the present invention is that it contains most of the necessary instrumentation required to safely fly and navigate an aircraft, and can function completely independent of the aircraft vacuum and power systems.

Brief Summary Text (59):
The present invention continually indicates the aircraft position over the surface of the earth (including over the seas). The invention can automatically tell the pilot how far off course his aircraft is, where his next heading is to be, and how to move his controls in order to restore his aircraft to the pre-determined flight path. This information only partially available on present navigation and ILS systems.

Brief Summary Text (62):
The primary object of the invention is to provide clear, easy to understand flight information to the pilot and to aid in a safe and efficient flight. A major object of this invention, therefore, is that; while using the Global Positioning System (GPS) as a source of continuous data, The Virtual Instrument Pilot can derive the following flight functions directly or by *mathematical computation: Latitude, Longitude, Altitude, Time, ground speed, vertical velocity, direction of travel, aircraft bank, aircraft pitch, wind vector, air speed, distance from a navigational reference, bearing to a navigational reference, relative direction of omni-bearing from navigational references, vertical and horizontal position along a glide path, physical maneuver to achieve destination at a specified altitude-speed-direction, and the control motion required to achieve the desired flight path.

Brief Summary Text (67):
Another object of this invention is to provide a navigation and control device which is free from failure due to mechanical, environmental, or power source factors. Units that are powered by vacuum systems are prone to failure due to corrosion if moisture gets into the system. Units that are powered by the electrical system usually fail when power is lost.

Brief Summary Text (69):
The invention will provide a unique approach to directing the pilot and dealing with disorientation. Much has been done in recent years to deal with this problem. Most approaches involve trying to make the instrument view of the flight situation as "real" as possible so that someone with less ability for spatial relations will more easily see and be able to correct the situation. While that approach might help, this invention intends to bypass the interpretation problem. The pilot will be presented with a direct solution to control and navigation of the aircraft, telling him or her which way and how much to move the controls in order to achieve the desired flight path correction.

Brief Summary Text (74):
It is an object of the present invention to provide a safer system for navigation and control of a fixed wing aircraft which is based upon the use of orbiting satellites, deriving flight information from a Global Positioning System.(GPS), Wide Area Augmentation System (WAAS), or from Differential Global Positioning System (DGPS).

Brief Summary Text (75):
Another object of the invention is to provide an improved Instrument landing System (ILS) in which spatial locations are derived without the use of conventional radar, radio, or standard communication methods. After the airport data is entered into the onboard computer, or the airport data is learned by the system, the pilot can find his way back to the airport and approach landing there, by utilizing the internal navigational and ILS system aids of the present invention.

Brief Summary Text (78):
Another object of the invention is to provide a navigation and control system which can function if all of the electrical power and vacuum power on the aircraft fails. Operation, of the Virtual Instrument Pilot will be powered by internal batteries which will be functional for a minimum of one hour after a complete power failure. It is expected that within one hour, the pilot can locate and land his disabled aircraft at an airport where he can obtain the needed assistance to correct his aircraft failure.

Brief Summary Text (79):
A major object of this invention, defined earlier, is that; by using the Global Positioning System (GPS) as a source of continuous data, we can derive the following flight functions directly by mathematical computation based solely upon the derived data: Latitude, Longitude, Altitude, Time, ground speed, vertical velocity, direction of travel, aircraft bank, aircraft pitch, wind vector, air speed, distance from a navigational reference, bearing to a navigational reference, relative direction of omni-bearing from navigational references, vertical and horizontal position along a glide path, physical maneuver to achieve destination at a specified altitude-speed-direction, and the control motion required to achieve the desired path.

Brief Summary Text (98):
FIG. 5 illustrates the basic Flight Instrument Display with optional navigation aids activated. The navigation aids are numerically illustrated. In this figure, they include the "Aim" figure, one Vector Omni Range (VOR) (A), and two Automatic Direction Finders. (ADF) (B&C).

Brief Summary Text (99):
FIG. 6 illustrates the Navigation Display in the present system. In most applications, this display is located directly under the Instrument Display of FIGS. 2, 3, and 4 for the economic advantage of sharing a display screen. However, there is no reason that it could not be placed separately in a more convenient location.

Brief Summary Paragraph Table (1):
GPS = Global Positioning System DGPS = Differential Global Positioning System WAAS = Wide Area Augmentation System ATC = Air Traffic Control MDA = Minimum Decent Altitude MAP = Missed Approach Point VOR = Vector Omni Range RNAV = Area Navigation ADF = Automatic Direction Finder LORAN = Long Range Navigation

Brief Summary Paragraph Table (2):
TABLE 1 Traditional Instrument Capabilities Differences From Instrument Functionality Standard Instruments Altimeter Full Adjustment no longer needed for barometric pressure Precision depends on rate / accuracy of position sensor Reporting Altimeter Modified ATC needs to know not to apply pressure correction Rate of Climb Full Precision depends on rate / Indicator accuracy of position sensor Attitude indicator Modified Coordinated flight required (minimum slip or skid) Also shows angle of climb and speed Provides electrical output for autopilot feedback Heading Indicator Modified Shows actual heading rather than aircraft pointing Pilot may select magnetic or true Does not function when standing still Turn and Slip Partial No slip - add simple bubble level Indicator Turn enhanced to the system No longer requires coordinated turn Rate-of-turn Partial No slip - suggest simple bubble Indicator Turn enhanced level be added to system No longer requires coordinated turn Air Speed Approximate Manually entered wind vector or calculated average Clock Full Continuously synchronized with national standard ILS Indicators Enhanced Actual and system defined MDA Minimum Decent Altitude MAP Missed Approach Point Marker Beacon Full Both Audio and display Identifier Non-Directional Full plus Same as advanced navigation Beacon Vector Omni Range Full plus Same as advanced navigation Advanced All types Marker Beacon, VOR, RNAV, Navigation ADF, LORAN, & GPS Navigation Enhanced Disorientation lifeline, Functions Automatically learns airport data

Detailed Description Text (2):
The Virtual Instrument Pilot, (this invention) provides three main functions: 1) aircraft instrumentation, 2) Aircraft navigation information, and 3) Automatic (or directed) Pilot. As long as satellite information is available, the system always displays instrument data.

Detailed Description Text (9):
The invention is also equipped with satellite sensing software. When first turned on, the system does a self-check and then looks for navigation satellites. A sky map will be displayed, showing the current location of satellites and their relative signal strengths. After the acquisition period of time, ranging from a few seconds to a few minutes, the instrument display will replace the sky map. Acquisition requires that at least 4 satellites are "seen" by the system.

Detailed Description Text (10):
In today's systems, a pilot flying on instruments, must maintain a mental image of the attitude and motion of the aircraft as well as its position relative to a number of fixes, navigational aids, pre-defined airways, and airports. The pilot continuously interprets this information from a plurality of instruments to determine what actions need to be taken in order to achieve a desired flight path. The pilot must know where he is, his ground speed, airspeed, altitude, and what direction to fly in order to get to his destination.

Detailed Description Text (13):
FIG. 3 is the same as FIG. 2, but the alphanumeric readouts on the Instrument

Display are further expanded and defined. In this figure, we find the direction of travel (21), he altitude of the aircraft (22), and the vertical speed (23). The vertical speed indicator changes sign to tell the pilot whether he is flying up (increasing altitude) or down (decreasing altitude), and indicates how fast he is rising or descending. In this figure we also find the BUG direction indicator (24) which corresponds to the position of the graphic bug on the compass rose. The ground speed or wind speed display (25) will simply say "Ground Speed" unless a wind vector has been entered as described later in this text. The current time (26) is displayed in 24 hour time. The aircraft longitude (27) and aircraft Latitude (28) are shown in the lower left comer of the display. The ILS outer marker (29), the ILS middle marker (30) the ILS inner marker (31) will flash if the aircraft is over one of these navigational aids (or a corresponding system generated navigational aid). The Aircraft ground speed (32) is shown in Knots.

Detailed Description Text (28):
FIG. 5 Shows the Instrument Display with optional navigation aids and the "Aim" figure turned on. Each of these navigational aid figures may be controlled separately by the control panel which will be described in FIG. 7.

Detailed Description Text (30):
FIG. 5 also show three navigational aids. The label of VOR A (52) on the compass rose indicates that the navigational aid is located in a direction that is 10 degrees east of North. The small arrow on the line indicates that the Omni-bearing setting for this navigational aid is in a direction toward the navigational aid. The line indicates that to get on the selected radial (omni-bearing) to the navigational aid, the pilot would have to fly to the right of that heading. The labels to ADF B (51) and ADF C (50) indicate the relative location of each navigational aid, but the absence of the arrow indicates that the navigational aid is being looked at as an ADF, and the vector to that aid will be directly from the center of the display.

Detailed Description Text (31):
Navigational Aid data, supplied by the FAA has been incorporated into the Virtual Instrument Pilot database. All locations, airports, NDB's, VOR's, fixes, or user defined locations may be used as either ADF locations (vectors direct to aid) or VOR's with Omni Bearing selectors (OBS's). Distance measuring equipment (DME) information is also provided for all facilities on the Navigation Display.

Detailed Description Text (32):
FIG. 6 is the Navigation Display. It is one of several displays which may occupy the Virtual Instrument Pilot secondary window. The Navigation Display provides detailed information on the status of each (up to 3) selected navigational aid. The Latitude (53) and Longitude (54) of the specified aid is shown. The location of that aid relative to a selected navigational aid is shown as range (55) and bearing (56) from that navigational aid. The relative position of the aid from the aircraft is updated once per second and is shown as range (57) and bearing (58). These updates continue, showing range and bearing even if the pilot has chosen not to have that specific navigational aid displayed in its graphic form as shown in FIG. 5.

Detailed Description Text (33):
The identifier of the selected aid (59) and the type of aid (60) are shown. Note that the type only determines which database the identifier refers to. Every aid (except ILS) may be treated as either a VOR or an NDB. If the aid is being used as a VOR, then the Omni-bearing (radial) to be displayed is shown (62). The graphical presentation of that VOR will have the same Label (61) as shown on this display. These fields of information are repeated for each selected navigational aid as shown for A (63), B, or C (numerically illustrated).

Detailed Description Text (34):

The Navigation Display shares its window with other textual data displays such as flight path, runway selection, or adaptation. While the window is in use for another function, the graphical presentation of each navigational aid will continue to function (if turned on).

Detailed Description Text (37):
The NAV button (75) and the DATA button (74) are the principal controls to determine which display is using the Navigational Display window. Pressing NAV will always restore the Navigational Display. The DIGIT button (64) is used principally to switch between navigational aids sorted by distance and stepping through each letter of an alphabetic sort. The INS button (65) is used to insert data, which in turn depends on the particular window being used. Similarly the DEL button (66) is used to delete items selected by the software, such as waypoints or navigational aids. The GOTO button (67) activates specific functions, such as flight paths and automatic pilot. The PANIC button (70) will cause the pilot or autopilot to be directed to straight and level flight at a level at or above 2000 feet (adaptable) above the nearest airport.

Detailed Description Text (46):
It is important to note that in this invention, the position sensor is used to determine all of the flight variables. While the use of the GPS for navigation is not new, the present invention makes use of special algorithms or computations which derive the aircraft performance solely from data supplied from the position sensor. In this respect, the invention is new and unique. For example, the wind vector, which is totally independent of the aircraft in that the wind vector is in air which is not coming from the aircraft, can be derived from changes in latitude and longitude as a function of time, as the aircraft follows a circular path of 360 degrees for one rotation.

Detailed Description Text (116):
Navigation Indicators

Detailed Description Text (117):
The advanced navigation features allow any known location in the system, including airports, marker beacons, fixes, non-directional beacons, Vector Omni Range (VOR) facilities, Area Navigation (RNAV) locations, or user defined latitude and longitude locations to be displayed with VOR or Automatic Direction Finder (ADF) information. RNAV locations may be defined relative to any non-RNAV or user defined location by an offset distance and direction. The graphic display shows a device tag placed in the appropriate heading next to the compass rose as shown in FIG. 3. If there is no Omni Bearing Selector (OBS) setting, the device looks like an ADF and is displayed as a line is drawn from the tag to the cross hair center. If an OBS is selected, the device looks like a VOR tilted toward the navigational aid location with the line being drawn from the tag toward the cross hairs but offset by an angle proportional to the angular difference from the OBS setting and the current radial. To avoid confusion, the TO-FROM flag is shown as an arrow on the OBS line.

Detailed Description Text (118):
Each tag is listed in a separate alphanumeric navigation table that provides the location identifier, current distance, current direction and the OBS setting, if any. In the case of an RNAV, the offset distance and direction from the identifier are illustrated. In the case of a user defined location, the latitude and longitude of the desired location are illustrated.

Detailed Description Text (119):
As the flight proceeds, the current distance and direction from the navigational aid are continually updated by the following computation. ##EQU6##

Detailed Description Text (121):

LatNav=latitude of navigational aid or user defined location in radians

Detailed Description Text (122):
LonNav=longitude of navigational aid or user defined location in radians

Detailed Description Text (123):
Navigation Functions

Detailed Description Text (124):
The navigation sub-system in the present invention has been designed to make flying simpler by allowing the pilot to act as an autopilot would. In operation, the pilot sees that the controls must be moved as indicated by the "aim" figure in order to maintain or return to a desired course (vertically, horizontally, and speed). All the pilot has to do to maintain or return to the desired course is to manipulate the aircraft yoke and throttle so that the "aim" figure moves to the center of the attitude indicator display and the "Aim" figure extension is minimized. This relocation of the "Aim" figure tells the pilot how to move the controls to achieve the desired flight path.

Detailed Description Text (125):
The navigation functions are geared toward driving the "aim" figure previously discussed. In addition, whenever following a path, the "bug" will point to the desired heading on the compass rose. All flight paths are multi-dimensional, defining latitude, longitude, altitude, as well as speed and direction of travel. The paths take into account the space required to make a turn and the maximum rate of climb or descent permitted by acceptable flying practice. The calculated paths are accurate enough to support the anticipation and countdown feature of the "Aim" figure.

Current US Original Classification (1):
701/3

CLAIMS:

1. We claim an electronic instrumentation system which comprises positioning sensors such as satellite global positioning system hardware and controlling software, said hardware and software being designed to provide a pilot of an aircraft with both manual and automatic control of his aircraft under any known weather conditions, including complete blindness to surrounding conditions and loss of conventional instrumentation and instrument power, said system being comprised of (a) a position determining device, (b) a graphic display, (c) a computer system, (d) software, (e) input connectors, (f) knobs, and (g) switches, wherein items (a) through (g) replace and/or supplement the conventional aircraft instrumentation on an instrument display, and thereby allow the aircraft pilot to maintain complete control of his aircraft, either by manual response to graphic direction as depicted on the graphical display screen or automatically, without the need for manual intervention, to follow either predefined paths and patterns as well as navigation by presently accepted methods and defined locations, said electronic instrumentation system further being capable of determining position and velocity relative to three dimensional locations of airports, fixes, conventional navigational aids, and user input locations, generating standard and non-standard approaches, flight paths and search patterns associated with the aforementioned locations, calculating current air speed and direction, as well as providing direct or partial replacements for conventional aircraft displays and instruments including attitude indicator, altimeter, reporting altimeter, rate of climb indicator, turn and slip indicator, heading indicator, rate-of-turn indicator, clock, marker beacon receiver, Distance Measuring Equipment (DME), Vector Omni Range (VOR), Area Navigation (RNAV), Automatic Direction Finder (ADF), Instrument Landing System (ILS), and Long Range Navigation (LORAN) without the use of any moving parts except knobs, switches and connectors.

2. The electronic instrumentation system of claim 1, wherein said system is implemented using a Global Positioning System (GPS) navigation system, may employ any position sensing system such as Differential Global Positioning System (DGPS), Wide Area Augmentation System (WAAS), Local Area Augmentation System (LAAS), or future systems as they are developed, and combinations thereof, which will provide at a minimum: time, latitude, longitude, and altitude position information and when available will also make use of derived data such as speed and direction.

4. The electronic instrumentation system of claim 1, wherein said system is further capable of displaying simultaneously, at the operator's discretion, some or all of the information normally obtained by this system from each of the specified navigation devices.

5. The electronic instrumentation system of claim 4, wherein said system attitude display indicator will optionally display up to a specified number of direction vectors indicating the location label and the relative position of any Vector Omni Range (VOR), Area Navigation (RNAV), Automatic Direction Finder (ADF), intersection, airport, or user defined location, and if a radial Omni Bearing Selector (OBS) has been defined, the offset angle of the aircraft from the OBS radial.

9. The electronic instrumentation system of claim 1, wherein said system will include flight-path functionality which will provide navigation assistance in Visual Flight Rules (VFR) weather and if approved by the Federal Aviation Administration (FAA), will enable flight even without visibility, down to the minimums specified by the FAA as noted on instrument approach procedures charts of U.S. Terminal Procedures.

Previous Doc Next Doc Go to Doc#

10/718,670

Refine Search

Search Results -

Terms	Documents
L23 and ((information or data) with (area$ or region$))	1

Database:
- US Pre-Grant Publication Full-Text Database
- US Patents Full-Text Database
- US OCR Full-Text Database
- EPO Abstracts Database
- JPO Abstracts Database
- Derwent World Patents Index
- IBM Technical Disclosure Bulletins

Search: L29

Refine Search | Recall Text | Clear | Interrupt

Search History

DATE: Friday, September 30, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L29	L23 and ((information or data) with (area$ or region$))	1	L29
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L28	L23 and (search$ with (area$ or region$))	1	L28
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L27	L23 and region$	1	L27
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L26	L23 and switch$	1	L26
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DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L24	L23 and search$	1	L24
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES;			

OP=OR

L23	6622085.pn.	2	L23
L22	L21 and l18	13	L22
L21	L20 or l19	13	L21
L20	L18 and @pd<=20030110	8	L20
L19	L18 and @ad<=20030110	13	L19
L18	L17 and l14	17	L18
L17	l15 or L16	7006	L17
L16	701/208.ccls.	1299	L16
L15	707/3.ccls.	5717	L15
L14	(switch$ with search$ with (region$ or area$ or local$)) and navigat$	97	L14
L13	L12 and (switch$ with search$ with (region$ or area$ or local$))	1	L13
L12	L10 or L11	131	L12
L11	L5 and @ad<=20030110	128	L11
L10	L5 and @pd<=20030110	83	L10
L9	L7 or L8	12	L9
L8	L6 and @pd<=20030110	11	L8
L7	L6 and @ad<=20030110	12	L7
L6	L5 and (divid$ with (area$ or region$))	17	L6
L5	L3 and ((switch$ or chang$) with (area or region$))	177	L5
L4	L3 and (701/208).ccls.	21	L4
L3	NAVIGAT$ AND 701/?.CCLS.	1203	L3
L2	701/208.CCLS.	1299	L2
L1	707/3.CCLS.	5717	L1

END OF SEARCH HISTORY

L29: Entry 1 of 1 File: USPT Sep 16, 2003

DOCUMENT-IDENTIFIER: US 6622085 B1
TITLE: Device and method for creating and using data on road map expressed by polygons

Brief Summary Text (11):
Furthermore, electronic maps can provide convenient functions such as alterations in scale and street search, etc. For example, in car navigation systems, a method of use is possible in which a street search is performed and a route is displayed on a map, with the vehicle being caused to run along this route; during this operation, a small-scale large-area map is displayed while the vehicle is running on high-speed roadways, and when the vehicle enters an urban area, the display is switched to a large-scale city map. In this case, if the route found as a result of the search runs along (for example) road A, then the route must be displayed on the same road A in both the large-area map and city map. Accordingly, it is necessary that there be a logical connection between the respective roads on the large-area map and the same roads on the city map. Generally, in the case of large-area maps, it is sufficient if roads are expressed as simple lines; accordingly, the road data in such a case is road network data in which points of intersection are expressed as nodes, and roads are expressed as vector data connecting these nodes. In the case of city maps, on the other hand, the road data is a collection of road outline line-segment data such as pairs of parallel lines and arc-form lines, etc., indicating the outlines of roads (as was described above). Conventionally, an association has been established between roads shown on city maps and roads shown on large-area maps by causing the center coordinates of intersections on city maps to correspond to the nodes of the road network data on large-area maps. As a result, however, even on city maps, routes found as a result of searching are simply expressed as zigzag lines connecting the center points of intersections; in such a case, it cannot be said that the advantages of city maps, which show road configurations in detail, are sufficiently obtained.

Brief Summary Text (14):
Still a further object of the present invention is to accomplish the automatic preparation of road data which is associated with road network data used in large-area maps, and which accurately expresses the road configurations used in city maps.

Brief Summary Text (22):
In a preferred embodiment of the present invention, when it becomes necessary to display a road map of an area that forms a part of the overall map region covered by the aforementioned road network data, the aforementioned shaped road polygon data is dynamically prepared for roads contained only in the aforementioned partial area

Brief Summary Text (25):
A preferred embodiment of this road map display device further comprises road network data, city map data, and a road polygon data preparation part which dynamically prepares road polygon data on the basis of the road network data and the city map data for roads included in an area that is to be displayed in cases

where it becomes necessary to display a road map of the area which forms a part of the overall map region covered by the abovementioned road network data.

Brief Summary Text (26):
The intersection polygon preparation device of the present invention receives road network data which has nodes that express intersections, and links between nodes that express roads between intersections, and city map data which has line-segment data that expresses the shapes of map elements as sets of shape element points. Furthermore, this device determines, in city map data, a specified search region that include nodes of interest in road network data, and searches within the determined search region for shape element points which are positioned so that these shape element points satisfy specified positional conditions. Next, using the shape element points that have been found as a result of the abovementioned search, this device prepares intersection polygon data for the abovementioned nodes of interest. Using this device makes it possible to prepare intersection polygon data automatically from road network data and city map data based on line segments. The intersection polygon data thus prepared inevitably has a data association with nodes in the road network data.

Brief Summary Text (27):
In a preferred embodiment, this device determines the abovementioned search region, and then splits this search region in to a plurality of sub-search regions using links connected to nodes, and determines inherent positional conditions as positional conditions for the respective sub-search regions. Then, this device searches in the respective sub-search regions for shape element points that satisfy the inherent positional conditions, collects the shape element points that are found in the plurality of sub-search regions, and prepares intersection polygon data. The respective sub-search regions include shape element points of the respective comer parts of intersections. Since the positional relationship between nodes of interest and the respective comer parts differs for each comer part, the shape element points of the respective comer parts can be securely extracted by determining inherent positional conditions that are suited to the respective comer parts for each sub-search region. Accordingly, accurate intersection polygon data can be obtained.

Brief Summary Text (29):
In a preferred embodiment, this device divides a city map region covered by city map data into numerous small cells, selects at least one cell that is located in close proximity to a position corresponding to the node of interest (e.g., the cell where the node of interest is positioned, or a cell adjacent to this cell) from the abovementioned cells as an object cell, and sets the abovementioned search region inside this object cell. The amount of data handled in the processing used to prepare respective intersection polygons is reduced by this method, so that the burden on the calculator used is lightened.

Brief Summary Text (30):
In a preferred embodiment, this device receives road map data that has road polygon data, and in cases where there are regions in which the road polygon data and the abovementioned intersection polygon data overlap, the aforementioned overlapping regions are removed from the road polygon data using the abovementioned intersection polygon data, so that pure road polygon data that does not overlap with intersection polygon data is prepared.

Brief Summary Text (31):
In a preferred embodiment, this device further determines a plurality of tangential lines that contact a plurality of roads from intersection polygon data, and extract two tangential lines from the plurality of determined tangential lines. Furthermore, within the polygon regions covered by the intersection polygon data, this device prepares substantially sector-shaped or substantially rectangular guiding intersection polygons that smoothly connect the two extracted tangential

lines to each other.

Brief Summary Text (33):
Another road map display device of the present invention receives road map data that has road polygon data and intersection polygon data, and also receives traffic jam information that indicates the end point position of a tailback of cars. Furthermore, this device selects road polygon data or intersection polygon data for a road or intersection in which the end point position of tailback of cars are present from the abovementioned road map data, and divides the selected road polygon data or intersection polygon data into a portion corresponding to an upstream side region and a portion corresponding to a downstream side region at the aforementioned end point position. Then, using the downstream side region of the split road polygon data or intersection polygon data, and road polygon data and intersection polygon data for roads and intersections which are located further downstream than the abovementioned downstream side region along the tailback of cars, this device displays the regions of roads and intersections in which the tailback of cars is present. As a result, the regions of roads on which there is a traffic jam can be accurately displayed.

Drawing Description Text (47):
FIG. 46 is a diagram which illustrates the principle whereby the regional range that is the object of conversion to polygons in the dynamic preparation of polygonal map data by a car navigation device is limited;

Detailed Description Text (8):
In this processing 3, line-segment data (link data between respective intersections) for respective roads included in the road network data stored in the road network data base 2 is expanded in the width direction to an extend exceeding the width dimension of the respective roads in the city map data 5, so that simple road polygon data, which covers the respective road regions in the city map data 5 with a slight excess margin, is prepared for each road. The simple road polygon data that has been prepared for each road is collected and stored in the simple road polygon data base 4 of the memory.

Detailed Description Text (13):
In this simple road polygon preparation processing 3, road network data for the object region is first read in from the road network data base 2. Generally, in this road network data, intersections and roads are respectively expressed as nodes and links. As is shown in FIG. 5(a), one link (road) 11 is a zigzag line that connects two adjacent nodes (intersections) 13 and 15, and this zigzag line is expressed using a plurality of straight line segments L1, . . . Ln that connect the initial-end node 13, respective intermediate shape element points (flexure points) 17, 17 . . . and the final-end node 15 in that order. Such road network data can be prepared from national road data on a 1:25,000 scale.

Detailed Description Text (15):
This simple road polygon 27 roughly expresses the shape of a single road that has a width dimension. Afterward, this simple road polygon 27 is shaped to the accurate shape of the road shown in the city map data by being trimmed (in other words, by having excess portions removed). Accordingly, it is necessary that this simple road polygon 27 have a width dimension that is greater than that of the accurate road shown in the city map data, so that the region of the accurate road is completely encompassed. For this reason, the element polygons 21i of the respective line segments Li are expanded in the abovementioned expansion processing so that these element polygons 21i have a width dimension that is slightly greater than the width dimension of the accurate road shown in the city map data For example, the amount of this expansion can be determined by the method shown in FIG. 6. Specifically, as is shown in FIG. 6, the line segments Li of the respective links of the road network data are superimposed on city map data 31. Then, perpendicular lines are extended on both sides from a plurality of ground points of the line segments Li as

indicated by the arrows, and the lengths d1, d2, . . . to the points where these perpendicular lines first cross line segments on the city map are measured. The lengths d1, d2 . . . of these perpendicular lines are viewed as values that represent the width to the edge lines on both sides from the center line of the road in question in road sections located in the vicinities of the respective ground points. Accordingly, for each side of the road, a weighted average is calculated by weighting the lengths d1, d2 . . . of the perpendicular lines with the distances of the road sections represented by the respective ground points, and these values are viewed as the widths from the center line on the respective sides of the road in question. To show the simplest example of calculation, the road width W1 on the upper side of the figure in the case of the example shown in FIG. 6 is determined as follows:

Detailed Description Text (25):
As was described above, scissors data defines cutting lines used to shape simple road polygons (which are prepared so that these shapes are slightly larger than actual road shapes) into accurate road shapes by trimming these simple road polygons. Accordingly, scissors data, i.e., cutting lines, ideally run along the accurate external shapes of the roads, and do not invade the internal regions of the roads. "Scissors" data preparation processing 6 is processing which is used to prepare scissors data that is as close to ideal as possible.

Detailed Description Text (27):
First, as is shown in FIG. 9(a), various types of attribute shape lines such as road outlines 53 and 57, building outlines 59, bridge outlines 55 and water system outlines 61 and 62, etc., that are present in the vicinity of the road in question are extracted for each road from city map data 51. In this case, a method in which (for example) city map data is divided into numerous segment by means of an appropriately fine mesh, the object of extraction is limited exclusively to shape lines that are present inside the segments through which respective links of the road network data pass when these links are superimposed on the city map, and the object of extraction is further limited exclusively to shape lines contained in rectangular regions that are defined by the maximum values and minimum values of the xy coordinates of the respective links, can be adopted in order to limit the object of extraction exclusively to shape lines that are located in the vicinity of the respective roads (i.e., in order to exclude shape lines that have no connection with the outline shapes of the respective roads).

Detailed Description Text (35):
As a result of the abovementioned series of processing operations, road polygons that show precise agreement with the shapes of roads expressed on city maps can be automatically prepared. In terms of characteristics, this data shows good compatibility with road network data, and the link relationships with large-area maps, etc., prepared from road network data are also clear. Furthermore, road connection information held in road network data can also be associated with the road polygons and thus retained.

Detailed Description Text (36):
In the case of road map data using the abovementioned road polygons, the regions of respective roads extending from each intersection to the next intersection are expressed by a single polygon each. An example of the construction of such road map data is shown in FIG. 12(A), and a road image displayed on a screen on the basis of this road map data is shown in FIG. 12(B). As is shown in FIG. 12(A), this road map data is constructed from a plurality of road polygons 201, 203 and 205. Here, the regions of the intersections are not distinguished from the road polygons 201, 203 and 205, but are instead included in the road polygons 201, 203 and 205. In the displayed road image, as is shown in FIG. 12(B), the region 207 where the plurality of road polygons 201, 203 and 205 overlap each other is visually recognized as an intersection by a human observer. However, the computer application that utilizes the abovementioned road map data cannot accurately distinguish or indicate

intersection regions and road regions in the road map data.

Detailed Description Text (37):
There is a demand for the utilization of road map data in applications that are more advanced than conventional applications. For example, in the case of route guidance to destinations in car navigation systems, the route has conventionally been displayed by simple zigzag lines in which intersections are connected by straight lines. However, a method in which the regions of the roads and intersections themselves that make up the route are displayed with greater emphasis allows easier viewing by the user. In cases where the latter type of route display is performed, it is desirable that intersections be expressed as independent polygons that are accurately distinguished from the road polygons in the road map data based on polygons, in order to increase the visibility of the intersection areas on the route. If the intersections are included in the road polygons as shown in FIG. 12(A), then in cases where (for example) a route that turns from the road polygon 201 to the road polygon 203 is displayed, the region 207 where these two road polygons 201 and 203 overlap will have an unnatural shape as an intersection, so that the visibility of this intersection is poor.

Detailed Description Text (39):
Furthermore, in regard to the display of intersection areas in guide routes, a display in which only the operating lanes within the intersection 209 are expressed as a guide route 213 as shown in FIG. 13(B) is easier to comprehend than a display in which the entire region of the intersection 209 is displayed as a guide route 211 as shown in FIG. 13(A). However, in cases where the only data used is intersection polygon data in which the entire region of an intersection is defined as one polygon, an easy-to-comprehend route display of the type shown in FIG. 13(B) cannot be displayed.

Detailed Description Text (42):
This road map data preparation device is typically a programmed general-use computer. The central processing unit 301 of this computer performs pre-processing 304, intersection polygon preparation processing 305, road polygon correction processing 308 and guiding intersection polygon preparation processing 310 in accordance with programs. A road network data base 302 which stores road network data in which intersections and roads are expressed as nodes and links, a city map data base 303 which stores city map data based on line segments in which building outlines and sidewalk shapes, etc., are drawn in detail, and a road polygon data base 307 which stores road polygon data (including intersection regions as shown for example in FIG. 12) prepared (for example) by the method already described with reference to FIGS. 4 through 11 on the basis of road network data and city map data, are accommodated in the memory of this computer as raw-material data.

Detailed Description Text (43):
The central processing unit 301 first performs pre-processing 304. This pre-processing 304 accesses the road network data and city map data in the memory, establishes agreement between the map space coordinates of the road network data and the map space coordinates of the city map data, and respectively divides the road network data and city map data into numerous cells (numerous rectangular regions of a uniform small size) so that the respective types of map data can be controlled in cell units.

Detailed Description Text (45):
Next, the central processing unit 301 performs road polygon correction processing 308. This processing 30 corrects the road polygon data (including intersection regions) read out from the road polygon data base 307 using intersection polygon data from the intersection polygon data base 306, thus preparing road polygon data that does not include intersection regions (hereafter referred to as "pure road polygon data"); the pure road polygon data thus prepared is then stored in a pure road polygon data base 309.

Detailed Description Text (48):
In the pre-processing 304, road network data from the data base 302 and city map data from the data base 303 are accessed in the memory of the central processing unit 301. Generally, however, as is shown in FIG. 15, the map region 313 expressed by the road network data and the map region 315 expressed by the city map data show disagreement in the coordinate space (e.g., in the latitude and longitude of the coordinate origin at the lower left end). Accordingly, the coordinate spaces of these two map regions 313 and 315 are caused to coincide as follows: specifically, the positional discrepancy between the two coordinate spaces (.DELTA.x, .DELTA.y) is calculated as follows.

Detailed Description Text (52):
Next, in the pre-processing 304, the city map data and road network data accessed in the memory are respectively divided into numerous cells (small rectangular regions) and controlled in cell units in order to reduce the amount of geometrical calculation required in the subsequent intersection polygon preparation processing 305. Specifically, as is shown in FIG. 17(A), the respective sets of road map data have a map element control table 329 in which pointers to all of the map elements 327 present inside the entire map region 325 covered by the data are registered. In the pre-processing 304, as is shown in FIG. 17(B), the entire map region 325 for the respective sets of map data is divided into numerous cells 331 of a uniform size. Then, aggregates of pointers to map element in the map element control table 329 are classified into aggregates of pointer to map elements present inside the respective cells 331, and indices 335 for the respective cells are assigned to the pointer aggregates 333 on a cell by cell basis. As a result, only the map elements present inside the respective cells are designated from the respective cells. In cases where one map element straddles a plurality of cells, the system is arranged so that this map element can be designated from the plurality of cells. The table 337 thus prepared, in which map elements are controlled on a cell by cell basis, will be referred to below as an "index table". Such an index table 337 is prepared for each set of road network data and city map data As the cell size is reduce, the quantity of object data handled by the computer can be limited to a smaller quantity; however, the number of cells that must be controlled is increased. Accordingly, the optimal value of the cell size is determined on a case by case basis.

Detailed Description Text (61):
In the road polygon correction processing 308, intersect point regions are removed from the road polygon data including intersection regions that is accumulated in the road polygon data base 307, using the intersection polygon data that is accumulated in the intersection polygon data base 306. As is shown in FIG. 26, the intersection polygon 355 expressed by the data from the intersection polygon data base 306 for the node of interest 339, and the road polygon data 357 expressed by the data from the road polygon data base 307 for the link L1 connected to the node of interest 339, overlap in the region 359 indicated by hatching. Accordingly, the overlapping region 359 is removed from the road polygon 355 by performing a geometrical calculation of the difference in regions between the road polygon 355 and intersection polygon 357.

Detailed Description Text (90):
The preparation of the intersection polygons, pure road polygons and traffic lane polygons described above can be accomplished using either a static method or a dynamic method. The static method is a method in which all of the intersection polygons, pure road polygons and traffic lane polygons are prepared in advance for the entire map region, and accommodated in a map data base. When a road map is to be displayed, polygons for the region that is to be displayed can be read out and displayed. On the other hand, the dynamic method is a method in which the polygons are not all prepared beforehand; instead, each time that a road map is to be displayed, only the polygons necessary for the required region are prepared from

city map data and road network data. The static method is usually used in road map display devices that have a large memory capacity. On the other hand, the dynamic method is used in map display devices in which it is difficult to guarantee a sufficiently large memory capacity, such as car navigation devices.

Detailed Description Text (91):
In cases where polygon map data is dynamically prepared in a car navigation device, etc., the time that can be used for the preparation of polygon data is limited; accordingly, it is important to select the roads that are to be converted into polygon data. FIG. 46 illustrates one principle that is used to determine the extent to which the range of the object region of polygon preparation should be limited when polygon map data is dynamically prepared in a car navigation device.

Detailed Description Text (95):
As is shown in FIG. 47, in the case of a stopped automobile or an automobile traveling at a very low speed, the mesh region M0 that includes the current position 701 of the automobile (the triangular mark indicates that the automobile is moving upward in the figure) and (for example) the eight adjacent mesh regions M1 through M8 that surround the mesh region M0 are taken as the object of polygon preparation. Then, these mesh regions M0 through M8 are processed with priority given to mesh regions in which there is a higher probability that the automobile will be present at a subsequent point in time (i.e., a higher probability that the driver will require data for these mesh regions), in accordance with the direction of advance of the automobile (or the direction in which the automobile is pointing when stopped). Initially, road and intersection polygons are prepared by processing the mesh region M0 that includes the current position 701. Next, the mesh region M2 which is located in front of the mesh region M0 of the current position is processed. Next to be processed are the mesh regions M1 and M3 (in either order), which are located obliquely in front on the left and right with respect to the direction of advance. Next to be processed are the mesh regions M4 and MS (in either order) which are located to the left and right of the mesh M0 of the current position. Next to be processed are the mesh regions M6 and M7 (in either order), which are located obliquely to the rear on the left and right of the mesh region M0 of the current position. The final mesh region to be processed is the mesh region M7, which is located to the rear of the mesh region M0 of the current position. As is shown in FIG. 48, when the automobile is operating at a moderate speed, the area to the rear of the current position 701 is ignored, and more mesh regions that are present in the direction of advance are taken as the object of polygon preparation. For example, the mesh region M0 of the current position, and the eight mesh regions M1 through M8 located in front and to the left and right of this mesh region M0 are taken as the object of polygon preparation. Then, similarly, these mesh regions M0 through M8 are processed in an order that gives priority to mesh regions in which there is a higher probability that the automobile will be present at a subsequent point in time (i.e., a higher probability that the driver will require data for these mesh regions), in accordance with the direction of advance of the automobile. Specifically, the first mesh region to be processed is the mesh region M0 of the current position of the automobile. The next mesh region to be processed is the mesh region M5 which is located in front of the mesh region M0 of the current position. Next to be processed are the mesh regions M2, M4 and M6 (in any order), which are respectively located further in front of the mesh region M0, and obliquely in front of the mesh region M0 on the left and right of the mesh region M0. The next regions to be processed are the mesh regions M1 and M3 which are located even further in front of the mesh region M0 on the left and right of the mesh region M0. The final regions to be processed are the mesh regions M7 and M8 (in either order), which are adjacent to the mesh region M0 on the left and right.

CLAIMS:

11. A road map display device comprising: a road map data receiving part which receives road map data that has road polygon data and guiding intersection polygon

data; traffic jam information receiving part which receives traffic jam information that indicates end positions of tailbacks of cars; a polygon dividing part which selects said road polygon data or said intersection polygon data for a road or intersection in which the end positions of the tailbacks of cars are present from said road map data, and divides said selected road polygon data or intersection polygon data into a region inside said tailbacks of cars and a region outside said tailbacks of cars at said end positions; and a display part which displays regions of roads and intersections in which said tailbacks of cars are present, using the region of said road polygon data or intersection polygon data inside said tailbacks of cars in which said end positions are present and which have been divided by said polygon dividing part, and said road polygon data and intersection polygon data for roads and intersections that are continuously present along said tailbacks of cars from the region inside said tailbacks of cars.

13. A road map display method comprising the steps of: receiving road map data which has road polygon data and intersection polygon data; receiving traffic jam information which indicates final end positions of tailbacks of cars; selecting said road polygon data and intersection polygon data for a road or intersection in which said final end positions of the tailbacks of cars are present from said road map data, and dividing said selected road polygon data or intersection polygon data into an upstream side region and a downstream side regions at said final end positions; and displaying the regions of roads and intersections in which said tailbacks of cars are present using the downstream side region of said road polygon data or intersection polygon data in which said final end positions are present and which have been produced by division in said polygon dividing step, and said road polygon data and intersection polygon data for roads and intersections that are present further downstream from said downstream region along said tailbacks of cars.

Previous Doc Next Doc Go to Doc#

TITLE: Database access mechanisms for a computer user interface

PUBLICATION-DATE: December 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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US-CL-CURRENT: 707/3

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 6. Document ID: US 6904362 B2

L18: Entry 6 of 17 File: USPT Jun 7, 2005

US-PAT-NO: 6904362
DOCUMENT-IDENTIFIER: US 6904362 B2

TITLE: Route guidance system, information delivery center, and vehicular route guidance apparatus

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 7. Document ID: US 6704647 B1

L18: Entry 7 of 17 File: USPT Mar 9, 2004

US-PAT-NO: 6704647
DOCUMENT-IDENTIFIER: US 6704647 B1

TITLE: Navigation system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 8. Document ID: US 6622085 B1

L18: Entry 8 of 17 File: USPT Sep 16, 2003

US-PAT-NO: 6622085
DOCUMENT-IDENTIFIER: US 6622085 B1

TITLE: Device and method for creating and using data on road map expressed by polygons

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 9. Document ID: US 6574554 B1

L18: Entry 9 of 17 File: USPT Jun 3, 2003

US-PAT-NO: 6574554
DOCUMENT-IDENTIFIER: US 6574554 B1
** See image for Certificate of Correction **

TITLE: System and method for calculating a navigation route based on non-contiguous cartographic map databases

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 10. Document ID: US 6351706 B1

L18: Entry 10 of 17 File: USPT Feb 26, 2002

US-PAT-NO: 6351706
DOCUMENT-IDENTIFIER: US 6351706 B1

TITLE: Navigation apparatus with navigation data processor and man-machine interface

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L17 and L14	17

Display Format: - Change Format

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Search Results - Record(s) 11 through 17 of 17 returned.

☐ 11. Document ID: US 6182121 B1

Using default format because multiple data bases are involved.

L18: Entry 11 of 17 File: USPT Jan 30, 2001

US-PAT-NO: 6182121
DOCUMENT-IDENTIFIER: US 6182121 B1

TITLE: Method and apparatus for a physical storage architecture having an improved information storage and retrieval system for a shared file environment

DATE-ISSUED: January 30, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wlaschin; Scott	Los Angeles	CA		

US-CL-CURRENT: 709/215; 707/1, 707/10, 707/3, 707/4, 707/8, 711/153, 711/173

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 12. Document ID: US 5977885 A

L18: Entry 12 of 17 File: USPT Nov 2, 1999

US-PAT-NO: 5977885
DOCUMENT-IDENTIFIER: US 5977885 A

TITLE: Land vehicle navigation apparatus with local route guidance selectivity and storage medium therefor

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 13. Document ID: US 5961571 A

L18: Entry 13 of 17 File: USPT Oct 5, 1999

US-PAT-NO: 5961571
DOCUMENT-IDENTIFIER: US 5961571 A

TITLE: Method and apparatus for automatically tracking the location of vehicles

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 14. Document ID: US 5944768 A

L18: Entry 14 of 17 File: USPT Aug 31, 1999

US-PAT-NO: 5944768
DOCUMENT-IDENTIFIER: US 5944768 A
** See image for Certificate of Correction **

TITLE: Navigation system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 15. Document ID: US 5680617 A

L18: Entry 15 of 17 File: USPT Oct 21, 1997

US-PAT-NO: 5680617
DOCUMENT-IDENTIFIER: US 5680617 A

TITLE: Computer-human interface which provides for user customization of object behavior

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 16. Document ID: US 5557522 A

L18: Entry 16 of 17 File: USPT Sep 17, 1996

US-PAT-NO: 5557522
DOCUMENT-IDENTIFIER: US 5557522 A

TITLE: Apparatus and method for guiding vehicle occupant to travel from present position of vehicle to set destination through display unit

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 17. Document ID: US 5363307 A

L18: Entry 17 of 17 File: USPT Nov 8, 1994

US-PAT-NO: 5363307
DOCUMENT-IDENTIFIER: US 5363307 A

TITLE: Measuring apparatus having an indicator for displaying tide or tidal current data

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 11 through 17 of 17 returned.

☐ 11. Document ID: US 6182121 B1

Using default format because multiple data bases are involved.

L18: Entry 11 of 17 File: USPT Jan 30, 2001

US-PAT-NO: 6182121
DOCUMENT-IDENTIFIER: US 6182121 B1

TITLE: Method and apparatus for a physical storage architecture having an improved information storage and retrieval system for a shared file environment

DATE-ISSUED: January 30, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wlaschin; Scott	Los Angeles	CA		

US-CL-CURRENT: 709/215; 707/1, 707/10, 707/3, 707/4, 707/8, 711/153, 711/173

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 12. Document ID: US 5977885 A

L18: Entry 12 of 17 File: USPT Nov 2, 1999

US-PAT-NO: 5977885
DOCUMENT-IDENTIFIER: US 5977885 A

TITLE: Land vehicle navigation apparatus with local route guidance selectivity and storage medium therefor

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 13. Document ID: US 5961571 A

L18: Entry 13 of 17 File: USPT Oct 5, 1999

US-PAT-NO: 5961571
DOCUMENT-IDENTIFIER: US 5961571 A

TITLE: Method and apparatus for automatically tracking the location of vehicles

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 14. Document ID: US 5944768 A

L18: Entry 14 of 17 File: USPT Aug 31, 1999

US-PAT-NO: 5944768
DOCUMENT-IDENTIFIER: US 5944768 A
** See image for Certificate of Correction **

TITLE: Navigation system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 15. Document ID: US 5680617 A

L18: Entry 15 of 17 File: USPT Oct 21, 1997

US-PAT-NO: 5680617
DOCUMENT-IDENTIFIER: US 5680617 A

TITLE: Computer-human interface which provides for user customization of object behavior

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 16. Document ID: US 5557522 A

L18: Entry 16 of 17 File: USPT Sep 17, 1996

US-PAT-NO: 5557522
DOCUMENT-IDENTIFIER: US 5557522 A

TITLE: Apparatus and method for guiding vehicle occupant to travel from present position of vehicle to set destination through display unit

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 17. Document ID: US 5363307 A

L18: Entry 17 of 17 File: USPT Nov 8, 1994

US-PAT-NO: 5363307
DOCUMENT-IDENTIFIER: US 5363307 A

TITLE: Measuring apparatus having an indicator for displaying tide or tidal current data

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

L28: Entry 1 of 1 File: USPT Sep 16, 2003

US-PAT-NO: 6622085
DOCUMENT-IDENTIFIER: US 6622085 B1

TITLE: Device and method for creating and using data on road map expressed by polygons

DATE-ISSUED: September 16, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Amita; Junya	Fukuoka			JP
Hattori; Yaheiji	Fukuoka			JP
Kobayashi; Hiroki	Fukuoka			JP
Kishikawa; Kiyonari	Kanangawa			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Hitachi Software Engineering Co., Ltd.	Kanangawa			JP	03
Kabushiki Kaisha Zenrin	Fukuoka			JP	03

APPL-NO: 09/ 890081 [PALM]
DATE FILED: October 1, 2001

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	11-15372	January 25, 1999
JP	11-189974	July 5, 1999

PCT-DATA:

APPL-NO	DATE-FILED	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
PCT/JP00/00248	January 20, 2000	WO00/43953	Jul 27, 2000		

INT-CL: [07] G06 F 17/00

US-CL-ISSUED: 701/208; 701/200, 701/211, 340/990, 340/950.1
US-CL-CURRENT: 701/208; 340/990, 701/200, 701/211

FIELD-OF-SEARCH: 701/200, 701/208, 701/211, 340/990, 340/995

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL | Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5204817	April 1993	Yoshida	701/209
☐	5214757	May 1993	Mauney et al.	345/751
☐	5982301	November 1999	Ohta et al.	340/995
☐	6014607	January 2000	Yagyu et al.	701/202
☐	6041281	March 2000	Nimura et al.	701/211
☐	6247019	June 2001	Davies	707/103R

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
2080774	April 1987	JP	
6339086	February 1988	JP	
4303271	October 1992	JP	
4303272	October 1992	JP	
112537	January 1999	JP	
6083931	January 1999	JP	

ART-UNIT: 3661

PRIMARY-EXAMINER: Cuchlinski, Jr.; William A.

ASSISTANT-EXAMINER: Gibson; Eric M

ATTY-AGENT-FIRM: Lathrop, Esq.; David N. Gallagher & Lathrop

ABSTRACT:

An object of the present invention is to accomplish the automatic preparation of road data in which roads and intersections are expressed by polygons that show accurate agreement with the complicated road shapes on city maps. In simple polygon preparation processing 3, the respective line segments of road network data 2 in which roads are expressed as line segments are expanded in the direction of the width dimension, thus producing simple road polygon data 4 which has a width that is slightly greater than the width of the roads in the city map data 5. Next, in scissors data preparation processing 6, scissors data 7 which defines the outlines of roads is prepared from the city map data 5 by connecting shape lines in the vicinity of roads. Next, in road polygon preparation processing 9, road polygon data 9 which shows good agreement with the shapes of roads in the city map data is prepared by trimming the simple road polygons along the road outlines defined by the scissors data.

42 Claims, 51 Drawing figures

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L28: Entry 1 of 1 File: USPT Sep 16, 2003

DOCUMENT-IDENTIFIER: US 6622085 B1
TITLE: Device and method for creating and using data on road map expressed by polygons

Brief Summary Text (11):
Furthermore, electronic maps can provide convenient functions such as alterations in scale and street search, etc. For example, in car navigation systems, a method of use is possible in which a street search is performed and a route is displayed on a map, with the vehicle being caused to run along this route; during this operation, a small-scale large-area map is displayed while the vehicle is running on high-speed roadways, and when the vehicle enters an urban area, the display is switched to a large-scale city map. In this case, if the route found as a result of the search runs along (for example) road A, then the route must be displayed on the same road A in both the large-area map and city map. Accordingly, it is necessary that there be a logical connection between the respective roads on the large-area map and the same roads on the city map. Generally, in the case of large-area maps, it is sufficient if roads are expressed as simple lines; accordingly, the road data in such a case is road network data in which points of intersection are expressed as nodes, and roads are expressed as vector data connecting these nodes. In the case of city maps, on the other hand, the road data is a collection of road outline line-segment data such as pairs of parallel lines and arc-form lines, etc., indicating the outlines of roads (as was described above). Conventionally, an association has been established between roads shown on city maps and roads shown on large-area maps by causing the center coordinates of intersections on city maps to correspond to the nodes of the road network data on large-area maps. As a result, however, even on city maps, routes found as a result of searching are simply expressed as zigzag lines connecting the center points of intersections; in such a case, it cannot be said that the advantages of city maps, which show road configurations in detail, are sufficiently obtained.

Brief Summary Text (26):
The intersection polygon preparation device of the present invention receives road network data which has nodes that express intersections, and links between nodes that express roads between intersections, and city map data which has line-segment data that expresses the shapes of map elements as sets of shape element points. Furthermore, this device determines, in city map data, a specified search region that include nodes of interest in road network data, and searches within the determined search region for shape element points which are positioned so that these shape element points satisfy specified positional conditions. Next, using the shape element points that have been found as a result of the abovementioned search, this device prepares intersection polygon data for the abovementioned nodes of interest. Using this device makes it possible to prepare intersection polygon data automatically from road network data and city map data based on line segments. The intersection polygon data thus prepared inevitably has a data association with nodes in the road network data.

Brief Summary Text (27):
In a preferred embodiment, this device determines the abovementioned search region,

and then splits this search region in to a plurality of sub-search regions using links connected to nodes, and determines inherent positional conditions as positional conditions for the respective sub-search regions. Then, this device searches in the respective sub-search regions for shape element points that satisfy the inherent positional conditions, collects the shape element points that are found in the plurality of sub-search regions, and prepares intersection polygon data. The respective sub-search regions include shape element points of the respective comer parts of intersections. Since the positional relationship between nodes of interest and the respective comer parts differs for each comer part, the shape element points of the respective comer parts can be securely extracted by determining inherent positional conditions that are suited to the respective comer parts for each sub-search region. Accordingly, accurate intersection polygon data can be obtained.

Brief Summary Text (28):
In a preferred embodiment, this device determines the proximate point that is closest to the node of interest in each of the plurality of sub-search regions within the aforementioned search region, and sets a band region which is separated from the node of interest by the distance range between a first distance extending from the node of interest to the proximal point and a second distance obtained by adding a specified permissible width to the first distance. Then, in each sub-search region, this device picks up only the shape element points present inside the band region as points that construct an intersection polygon. Accurate intersection polygons can be obtained with high precision by this method.

Brief Summary Text (29):
In a preferred embodiment, this device divides a city map region covered by city map data into numerous small cells, selects at least one cell that is located in close proximity to a position corresponding to the node of interest (e.g., the cell where the node of interest is positioned, or a cell adjacent to this cell) from the abovementioned cells as an object cell, and sets the abovementioned search region inside this object cell. The amount of data handled in the processing used to prepare respective intersection polygons is reduced by this method, so that the burden on the calculator used is lightened.

Detailed Description Text (55):
Once the object region 343 for the node of interest has thus been limited, the node of interest 339 on the road network map and the links L1 through L4 that are connected to this node of interest 339 are superimposed on map elements such as building outlines, road outlines and sidewalk boundaries, etc., in the object region 343 of the city map as shown in FIG. 19. Then, a search is made for the shape element points 347 of the map elements on the city map from a circular region (search range) 345 with a specified radius of R centered on the center of gravity of the node. Here, the term "center of gravity of the node" refers to the node of interest 339 itself, or the center of gravity calculated from all of the shape element points present within a specified distance range from the node of interest 339 (this is advantageous in cases where the node of interest 339 is considerably shifted from the actual center of the intersection). In the example shown in FIG. 19, the node of interest 339 is set as the center of gravity of the node in order to make this node easier to comprehend. Furthermore, the term "shape element point" refers to end points and corner points of the map elements (zigzag line segments) on the city map based on line segments.

Detailed Description Text (56):
In cases where a search is made for shape element points 347 from the search range 345, the angles .theta.1 through .theta.4 between the links L1 through L4 that are connected to the node of interest 339 are first determined (in other words, the search region 345 is divided by links L1 to L4 into a plurality of sectors S1 through S4). Here, .theta.1 is the angle between L1 and L2, .theta.2 is the angle between L2 and L3, .theta.3 is the angle between L3 and L4, and .theta.4 is the

angle between L4 and L1. Furthermore, a search is made for shape element points 347 in each range of the respective angles .theta.i (i=1, 2, 3, 4) (i.e., in each sector Si).

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Search Results - Record(s) 1 through 10 of 17 returned.

☐ 1. Document ID: US 20050102101 A1

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L18: Entry 1 of 17 File: PGPB May 12, 2005

Y

PGPUB-DOCUMENT-NUMBER: 20050102101
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050102101 A1

TITLE: System and method for calculating a navigation route based on non-contiguous cartographic map databases

PUBLICATION-DATE: May 12, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Beesley, Darin J.	Overland Park	KS	US	
Childs, Michael	Olathe	KS	US	

US-CL-CURRENT: 701/209; 340/995.23, 701/201, 701/208

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 20050050035 A1

Y

L18: Entry 2 of 17 File: PGPB Mar 3, 2005

PGPUB-DOCUMENT-NUMBER: 20050050035
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050050035 A1

TITLE: Address searching system and method, navigation system and computer program product

PUBLICATION-DATE: March 3, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Ono, Kouichi	Saitama		JP	

US-CL-CURRENT: 707/3

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 3. Document ID: US 20040138810 A1

L18: Entry 3 of 17 File: PGPB Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040138810
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040138810 A1

TITLE: Map search system

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Sugawara, Yoshihiko	Obu-city		JP	

US-CL-CURRENT: 701/208; 340/995.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 4. Document ID: US 20040049340 A1

L18: Entry 4 of 17 File: PGPB Mar 11, 2004

4

PGPUB-DOCUMENT-NUMBER: 20040049340
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040049340 A1

TITLE: Navigation device

PUBLICATION-DATE: March 11, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Usui, Yoshimasa	Nagoya-city		JP	

US-CL-CURRENT: 701/209; 340/995.19, 701/208

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 5. Document ID: US 20030229631 A1

L18: Entry 5 of 17 File: PGPB Dec 11, 2003

PGPUB-DOCUMENT-NUMBER: 20030229631
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030229631 A1